DEVELOPMENT OF MATHEMATICS MODULE BASED ON RECIPROCAL TEACHING LEARNING MODEL ON SUB-MATERIAL LINEAR EQUATION AND INEQUALITIES OF ONE VARIABLE

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ABSTRACT

Lack of mathematical communication and students' learning independence and low creativity become obstacles in achieving educational goals. One of the teaching materials that can help to achieve education goals is a module. These research aims are to develop, test the feasibility and know the student's response to the development of mathematics module based on the learning model of reciprocal teaching on the subject of equations and linear inequality of one variable. The type of research conducted is development research (R&D). The development mathematics module's research subjects are media expert, material expert, and some junior high school students (SMP) Muhammadiyah 1 Godean and State Junior High school (SMP N) 2 Tempel. This research object is the learning module of mathematics based on reciprocal teaching for SMP Class VII in the sub-material Equations and Linear Inequality One Variable. The data collection techniques are based on interviews in both schools. The research instrument use questionnaires. The data from the research results are analyzed qualitatively and quantitatively. The qualitative data get from interviews, and the quantitative data get from Questionnaires. The research results show that media experts give scores of ratings had an average of 131.5 in excellent criteria; scores by material experts had an average of 133.33 that indicate very well criteria. The result of the student response instrument calculations had an average of 124.12 in very well criteria. Based on the calculation, the mathematics module is developed can be used in learning mathematics.

Keywords: Module, Reciprocal Teaching, Equation, and Linear Inequalities of One Variable.

INTRODUCTION

Education is one of the keys to success and provides a better life if education can achieve its predetermined goals. Education in Indonesia can be achieved by implementing school education that studies various sciences, mathematics. The implementation of education in Indonesia is based on education, including the principle of independence in learning. Learning independence can be realized if the teacher acts as a facilitator and motivator and acts as an information and organizer. As a facilitator, the teacher is expected to provide a learning resource. At the same time, the teacher's role as a motivator strives to utilize a learning resource. The government strives to utilize learning resources through Article 1 No. Twenty of the Law of the Republic of Indonesia of 2003 concerning the National Education System states that learning is a process of interaction of students with educators and learning resources in a learning environment.

According to AECT (Association of Education and Communication Technology), one learning source is learning resources designed (resources by design). Learning resources designed are textbooks, worksheets, modules, practical instructions, and so forth. Prastowo, Andi (2015: 34). Modules are one form of teaching material packaged in a whole and systematic way, which includes a set of planned learning experiences and is designed to help students master specific learning goals. The module functions as an independent learning tool to learn independently according to their respective speeds (Daryanto, 2013: 9). Making learning modules must be based on the modules' characteristics, including Self Instructional, Self Contained, Stand Alone, Adaptive, and Friendly / Familiar (User Friendly). (Daryanto, 2013: 9-11). A good module is a module that is arranged based on students' needs based on learning models.

Students who learn the reciprocal teaching-learning model will act as teachers to deliver the material to their friends. While the teacher acts as a scaffolding, facilitator, and guide in learning, whose task is to straighten or explain the material that students cannot complete. Shoimin, Aris (2014: 153). According to Barkley et al. (2012: 200), reciprocal teaching active teaching, not passive, requires students to give and receive when students help each other to gain knowledge and understanding. Through the preparation of mathematical modules, it is expected to improve mathematical communication of creativity, learning independence, attract students' interests, activate students in teaching and learning activities through discussion, and make it easier for students to remember, understand the material and apply the material learned to work on the problems.

Understanding Mathematical communication expressed by Romberg and Chair in Sumarmo (Rachmayani, Dwi. 2014: 16) namely connecting real objects, pictures and diagrams into mathematical ideas, explaining ideas, situations, and mathematical relations verbally or in writing with real objects, pictures, graphs, and algebra, stating daily events in mathematical language or symbols, listening, discussing, and writing about mathematics, reading with an understanding of a written mathematical presentation, making conjectures, compiling arguments, formulating definitions and generalizations, explaining and making questions about the mathematics being studied. Furthermore, according to Rachmayani, Dwi (2014: 18), student learning independence is students' behavior in manifesting their desires or desires in a real way without depending on others. In this case, the students can do their learning, determine effective learning tasks, carry out learning tasks well, and independently carry out learning activities.

However, there are still some obstacles to achieving the goals set. Lack of mathematical communication and independence of learning, low student creativity, and learning are still limited to using textbooks and worksheets outside the school whose contents do not match school material. Learning activities in groups and discussions have not been maximized. Some students still consider mathematics to be difficult subjects. It is an obstacle obtained based on interviews in SMP Muhammadiyah 1 Godean and SMP N 2 Tempel. To reduce obstacles in achieving educational goals is to develop teaching materials in mathematics modules based on reciprocal teaching-learning models. The module comprises core competencies and basic competencies adapted to learning in junior high school and curriculum used in equations and linear inequalities of one variable.

The preparation of the module is to improve mathematical communication, creativity, and independence in learning. Helping students learn independently or in groups. Maximizing discussion activities and helping students remember, understand the material, and apply it to practice questions. Thus, in the module's preparation, it is hoped that it can help students understand the material and train student cooperation, primarily learning mathematics. By looking at various obstacles and paying attention to alternative solutions described, this study aims to develop a mathematical module based on reciprocal teaching-learning models on equations and linear inequalities of one variable. This development's objectives are as follows: (1) to develop a mathematics module based on reciprocal teaching-learning models for grade VII junior high schools on the subject of equations and linear inequalities of one variable. (2) To test the quality/feasibility of a mathematics module based on a reciprocal teaching model for junior high school grade VII on the subject of equations and linear inequalities of one variable. (3) To determine students' responses about the effectiveness/feasibility of mathematics modules based on reciprocal teaching-learning models for grade VII junior high schools on equations and linear inequalities of one variable.

METHODS

This type of research is research and development with research steps covering potential and problems, data collection, product design, design validation, design revision, product testing, product revision, trial use, product revision, and production mass. (Sugiyono, 2015: 409). This research was conducted at SMP Muhammadiyah 1 Godean and SMP N 2 Tempel on June 13, 2017, and June 15, 2017. The development trial subjects were media experts, namely UAD mathematics education lecturers

and SMP Muhammadiyah 1 Godean teachers. Material expert in mathematics teacher grade VII SMP Muhammadiyah 1 Godean and SMP N 2 Tempel and students in grades VII A through class VII E SMP N 2 Tempel and SMP Muhammadiyah 1 Godean in the 2016/2017 school year. This study's object is a mathematics learning module based on a reciprocal teaching-learning model for SMP Class VII on equations and linear inequality of one variable. The types of data in this research are qualitative and quantitative data. The data collection technique is to use interview guidelines. This research development instrument is to use a Questionnaire for media experts, material experts, and student responses.

The data analysis technique used in this research development is a qualitative data technique that is focused during the process in the field together with data collection using the Miles and Huberman Model analysis in (Sugiyono, 2015: 337), which includes Data Reduction, Data Display (Data Presentation), and Conclusion Drawing (verification). Quantitative data were obtained from media experts' assessment, material experts, and student responses when filling out the Questionnaire. The data obtained were measured using a Likert scale as in Table 1.

Table 1. Rules for Rating Scores Using a Likert Scale

Information	Score
SS = Strongly Agree	5
ST = Agree	4
RG = Doubtful	3
TS = Disagree	2
STS = Strongly Disagree	1

(Sugiyono, 2015: 134)

However, the assessment on the Questionnaire given is better is to change the RG scale (Doubtful) to CB (Good Enough) and change the word Agree to the word Good. So the rules table 1 for giving the Likert scale becomes as in Table 2.

Table 2. Instrument assessment guidelines

Information		Score
SB	Very good	5
B	Good	4
CB	Pretty good	3
TB	Not good	2
STB	Very bad	1

After the data is collected, the average of each scale is calculated using the average formula.

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{N}$$ (Sukarjo, 2006: 55)

Information:

$\bar{X}$ = average score

X_i = the score of the i-appraiser

N = the number of assessors

The data is compared to the average value with the following criteria as in Table 3.

Table 3. Instrument Rating Guidelines

Range of scores (i) quantitative	Classification
$X > \bar{X}_i + 1{,}8\ SB_i$	Very Good
$(\bar{X}_i + 0{,}6\ SB_i) < X \leq (\bar{X}_i + 1{,}8\ SB_i)$	Good
$(\bar{X}_i - 0{,}6\ SB_i) < X \leq (\bar{X}_i + 0{,}6\ SB_i)$	Enough
$(\bar{X}_i - 1{,}8\ SB_i) < X \leq (\bar{X}_i - 0{,}6\ SB_i)$	Less
$X \leq (\bar{X}_i - 1{,}8\ SB_i)$	Very Less

(Sukarjo, 2006:238).

Information:
$\bar{X}_i$ = Average ideal
SB_i = Ideal standard deviation
X = Actual score

The validation results for media experts, material experts, and student responses are summed, calculating the average ideal and ideal standard deviation. The categories are determined by referring to the Table above. Table 4, Table 5 and Table 6 show the results of the assessment categories for each device.

Table 4. Guidelines for Media Expert Rating

Assessment	Classification
$X > 117$	Very Good
$95{,}2 < X \leq 117{,}6$	Good
$72{,}8 < X \leq 95{,}2$	Enough
$50{,}4 < X \leq 72{,}8$	Less
$X \leq 50{,}4$	Very Less

Table 5. Guidelines for Expert Material Evaluation

Assessment	Classification
$X > 126$	Very Good
$102 < X \leq 126$	Good
$78 < X \leq 102$	Enough
$54 < X \leq 78$	Less
$X \leq 54$	Very Less

Table 6. Guidelines for Assessing Student Responses

Assessment	Classification
$X > 121{,}8$	Very Good
$98{,}6 < X \leq 121{,}8$	Good
$75{,}4 < X \leq 98{,}6$	Enough
$52{,}2 < X \leq 75{,}4$	Less
$X \leq 52{,}2$	Very Less

Based on the above Table above, it can be seen in the module feasibility indicator. The module can be feasible in media experts if the module is at a minimum data calculation between $95.2 < X < 117.6$. For material experts, the module can be said to be feasible if the calculation of the value in a minimum questionnaire is in the range of 102 <X≤126. While the feasibility indicator on student responses can be achieved if the calculation of the minimum questionnaire data is between $98.6 < X < 121.8$

RESULTS AND DISCUSSION

Development of a mathematics module based on reciprocal teaching-learning models on the subject of equations and linear inequalities of one variable using trial data which includes preliminary observations made through interviews with mathematics teachers, library staff, and some students at SMP Muhammadiyah 1 Godean and SMP N 2 Tempel aimed at to gather information about potentials and problems in both test schools.

Data collection is done through reference studies of learning models and materials presented in modules, preparation of learning modules, and product trials. The reference study was discussed with the supervisor, math teacher at SMP Muhammadiyah 1 Godean, and SMP N 2 Tempel. The preparation of the learning module refers to the steps according to Prastowo, Andi (2012: 96-99) and Hamdani (2011: 221-222), which include: (1) Curriculum Analysis based on Permendikbud Number 24 of 2016

Appendix 15 and Elementary Competencies of junior high schools (SMP) / Madrasah Tsanawiyah (MTs). (2) Determine the module Title and the title of each student worksheet. The module title is Mathematics Module for Class VII Middle School-Based on Reciprocal Teaching-Learning Model with Material Equation and Inequality of Linear One Variable. While the titles of each student worksheet are (a) Open Statements and Sentences, (b) Definition and Resolution of Equations, (c) Equivalents, Fractions and Decimals, (d) Application (PLSV), (e) Definition of Linear Inequality of One Variable, (f) Resolution of One Variable Linear Inequality, (g) Fractions, Decimals, and Compound Inequalities, (h) Application (PTLSV).

The next step (3) prepares references using books downloaded online and mathematics books for Class VII Junior High School curriculum 2013 and additional material using the Junior High School KTSP mathematics books. (4) Identifying essential competencies, studying learning materials, and designing appropriate forms of learning activities. (5) Identifying indicators of competency achievement and designing the form and type of assessment to be presented. (6) Preparation of the material, (7) Teaching sequence based on reciprocal teaching-learning models includes grouping, question generating, presenting the results of group work, Clarifying, Predicting, and Summarizing. (8) Designing module writing formats, (9) Arranging draft modules and modules.

Mathematical modules based on reciprocal teaching-learning models on the material of equations and linear inequalities of one variable can be seen in the appendix with the following display description. (1) Front cover and back cover, (2) front cover: cover page, book identity, Preface, Presentation of module contents, Table of contents, introduction, and material map. (3) The content part includes the student worksheet cover, the module content material using the reciprocal teaching-learning model, summary, and competency test. (4) The final part of the module includes: answer key and bibliography.

Product trials were carried out two times, namely trials of small classes and large classes. Small class trials are conducted on June 13, 2017, with five respondents in each test school. Extensive class tests are conducted on June 15, 2017, with 25 respondents in each test school.

The validation results by media experts and material experts and student responses through trials in small classes and large classes then obtained the following results.

Table 7. Results of Calculation of Media Expert Rating

Media Expert	**Score**
Syariful Fahmi, M.Pd	133
Ovayagori Rahman, S.Pd	130
Total Number	263
Mean	131,5
Category	Very Good

Table 7 shows the mathematics module's assessment scores based on reciprocal teaching-learning models on equations and linear inequalities of one variable totaling 131.5. The module is included in the excellent category.

Table 8. Results of Calculation of Expert Material Evaluation

Media Expert	**Score**
Dra. Sumargiyani, M.Pd	140
Andriani Sapto Rahayu, S.Pd	132
Dina Mardiyati,S.Pd	128
Total Number	400
Mean	133,33
Categori	Very Good

Table 8 shows the mathematics module's assessment scores based on reciprocal teaching-learning models on equations and linear inequality of one variable totaling 133.33. The module is included in the excellent category.

Table 9. Calculation Results of Student Response Instruments

Assessment	Average score
Uji Coba Kelas Kecil	122,4
Uji Coba Kelas Besar	125,8
Dina Mardiyati, S.Pd	128
Total Number	248,24
Mean	124,12
Category	Very Good

Table 9 shows that student responses to the mathematics module based on reciprocal teaching-learning models on the subject of equations and linear inequality of one variable with an average of a small class and large class trials amounted to 124.12, the criteria obtained based on the results of these trials are known very good.

The mathematics module based on reciprocal teaching-learning model on the equation and linear inequality of one variable validated and tested has been revised and has not experienced significant changes from the initial product design. The module has the following arrangement. (1) Display of front cover and back cover, (2) The front cover includes Identity of the book, preface, presentation of module contents, Table of contents, introduction, and material map, (3) Content section, including Front cover of student worksheet, Step 1 Grouping, Step 2 Question Generating, Step 3 Presenting Group Work Results, Step 4 Clarifying, Step 5 Predicting, Step 6 Summarizing, summary, and competency test. (4) The back, including bibliography and answer key.

CONCLUSION

The research results concluded that in developing a mathematical module based on reciprocal teaching-learning models on the material equation and linear inequality, one variable was achieved by producing a module product using the Research and Development (R&D) research step. The feasibility of a mathematics module based on reciprocal teaching-learning model for SMP Class VII on the subject of equations and linear inequality of one variable is shown through the results of the assessment of media experts with a score of 131.5 in the excellent category, material experts with a score of 133.33 with an outstanding category. When using a mathematics module based on a reciprocal teaching-learning model with 124.12 categories, student responses are very good.

Based on the assessment of media experts, material experts, and student responses, it can be concluded that the mathematics module based on the reciprocal teaching-learning model on the material equation and linear inequality of one variable is feasible to use. The mathematics module results based on reciprocal teaching-learning models on the material equation and linear inequality of one variable are feasible from the conclusions obtained. Thus, when studying the material of equations and linear inequalities of one variable, students should use a mathematical module based on reciprocal teaching-learning models to reference teaching materials other than textbooks. When giving linear one-variable equality and inequality material, the teacher should use a mathematics module based on reciprocal teaching-learning models as additional subject matter and variance in learning models. Schools should use mathematics modules based on reciprocal teaching-learning models to add teaching materials used in teaching and learning activities and mathematics teaching materials available in the library.

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